PATENT SPECIFICATION (11) 1345692

1345692

(21) Application No. 21220/72 (22) Filed 6 May 1972

(44) Complete Specification published 30 Jan. 1974

(51) International Classification G03G 5/06

(52) Index at acceptance

H1K 243 247 249 332 50X 621

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(19)

(54) ELECTROPHOTOGRAPHIC RECORDING MATERIAL

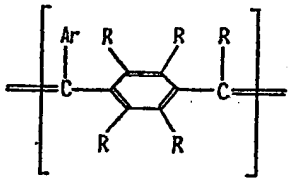
(71) We VEB PENTACON DRESDEN KAMERA-UND KINOWERKE, a corporation organised under the laws of Eastern Germany, of 76 Schandauer Strasse, Dresden, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an electrophotographic recording material made by means of organic photoconductors.

A number of polymeric organic photoconductors has already been proposed for use in electrophotography. However, the manufacture of applicable layers without additional bonding agent presents difficulties because the material is frequently insoluble and infusable, particularly with higher molecular weight photoconductors and with lower molecular weight or else the introduction of additional optical sensitizers is necessary if the layer is to be sufficiently sensitive in the visible light range. In addition, with known inorganic electrophotographic materials (selenium, zinc oxide) the undesirable effect may occur that the layers permit a charging only at one polarity.

The invention has the object of providing photoconducting material in which the above drawbacks are avoided, and which may, therefore, be used advantageously from a solution to form a film on a suitable carrier material, the material having, in view of its molecular structure a high degree of photosensitivity and being chargable both positively and negatively.

According to the invention we provide an electrophotographic recording material comprising a conjugated oligomeric or polymeric condensation photoconducting product having photosensitivity in both visible and ultraviolet ranges of the spectrum and being chargeable with either a positive or negative charge and containing units having the formulae:



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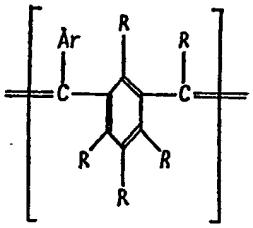
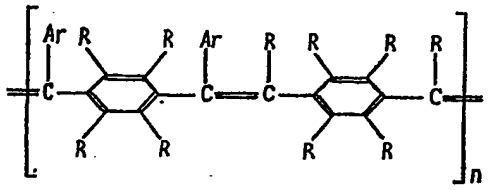


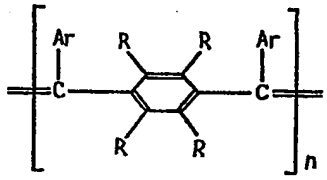
wherein Ar is an aryl group and each R may be any of hydrogen, halogen, alkyl, alkoxy, cyano or aryl groups, the product being applied from solution onto glass, metal or plastic foil without addition of an optical sensitizer. Preferably Ar is a substituted or unsubstituted phenyl group.

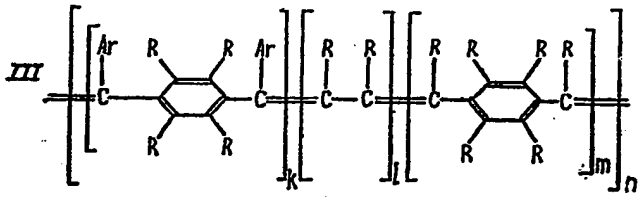
[*Price 25p*]

According to a further feature of the invention, the said material is used at a proportion of 2 to 99 per cent in combination with a number of film or layer forming materials which are not photoconducting, without thereby substantially impairing its photoelectric and optical properties.

By way of example, conjugated condensation product with the following structural types are particularly suitable.

I 

II 

III 

In these formulae Ar is an aryl group, preferably an unsubstituted or substituted phenyl group, the substituents R may be: hydrogen, halogens, alkyl, alkoxy, cyano or aryl groups, k, l, m and n are whole numbers with the condition that $n \geqslant 1$ and that $k \geqslant 1$. Instead of the para-linked benzene nuclei, meta-linked structures may also occur.

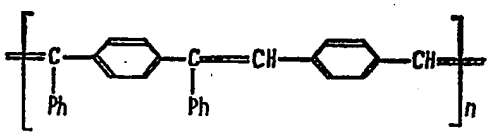
Substances having the structures shown above are generally soluble in aromatic hydrocarbons, e.g. in benzene, toluene, in chlorinated hydrocarbons such as, e.g. carbon tetrachloride, chloroform, methylene chloride and in dimethylene sulphoxide, dimethyl formamide, and similar organic solvents. They are generally insoluble in the aliphatic hydrocarbons usually used as carrier fluids in electrophotographic liquid developers.

The nonphotoconducting components in the combinations according to the invention are preferably polystyrene or silicone varnishes.

It should be stressed that the electrophotographic recording material applied according to the invention forms clear, well adhering layers on plastic foils, and preferably on polyester foils, even under flexible stresses, thereby making possible the manufacture of a filmlike electrophotographic recording material which may also be used in transparent applications.

Example 1

A uniform film is applied to a metal plate by coating it with a 4 per cent toluene solution of a conjugated condensation product of terephthalophenone and p-xylylen-bis (diphenyl phosphine oxide) containing structural elements according to the general formula I of the following kind

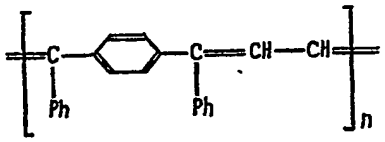


and the solvent is removed by drying at 120°C. A clear transparent layer is formed with a thickness of 1μm and 5 μm which is suitable for electrophotographic purposes.

Example 2

A mixture is made with silicone varnish from a solution of a conjugated condensa-

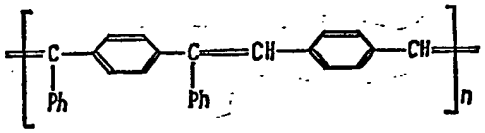
tion product of terephthalophenone and ethane-1,2-bis (diphenyl phosphine oxide) containing structural members according to the general formula II.



The conjugated polycondensate is dissolved for this purpose at a weight ratio of 50:50 with a silicone varnish of the type NH 12 (VEB Chemiewerk Nünchritz) in toluene. A metal plate is uniformly coated with the viscous solution and the solvent is removed by drying for 10 hours at 150°C. A photoconducting layer of 3 to 8 μm is obtained with high dark resistance, which is suitable for electrophotographic purposes.

Example 3

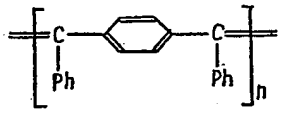
A uniform film is applied from a benzole solution of 20 parts polystyrene and 80 parts of a conjugated poly condensation product, containing structural elements with the following formula



to a PETP foil of 0,10 mm thickness by coating. After removal of the solvent by drying in a vacuum, a clear transparent film is obtained with a thickness of about 3 μm which is suitable for electrophotographic purposes.

Example 4

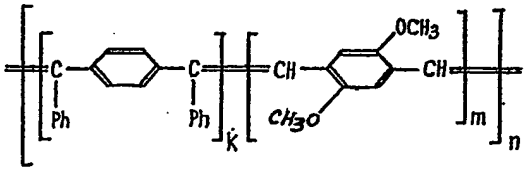
A solution is made in toluene containing 90 parts solids of silicon varnish NH 12 (VEB Chemiewerk Nünchritz) and 10 parts solids of a conjugated condensation product of the structural elements according to general formula II



A metal plate is uniformly coated with this solution. The resulting clouded film is dried for 3 hours at 100°C and hardened for 5 hours at 200°C. A mechanically strong layer is formed which has photoconducting properties at high dark resistance and is suitable for electrophotographic purposes.

Example 5

A uniform film with a thickness of about 2 μm is formed on a metal plate by coating with a 2 per cent toluene solution of a orange coloured coloured condensation product containing aa'-diphenyl xylylidene and 2,5-dimethoxy xylylidene structural members according to the following formula



The ratio of k:m is not critical.

After removing the residual solvent by drying at 120°C the coated plate may be used for electrophotography.

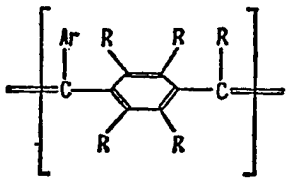
The layers, made according to examples 1 to 5, were tested with regard to their electrophotographic properties by the usual means.

They were charged to the positive or negative saturation potential by means of Corotron charging electrodes; the saturation potential was at the layer thicknesses given in the examples between $\pm$250 V and $\pm$400 V and was reached at a charging speed of 10 cm/s, if a high voltage of $\pm$9 kV was applied to the Corotron. For producing a high contrast latent picture adapted to be developed by a cascade or liquid developer,

an exposure time of 5—15 seconds is necessary under a magnifying apparatus equipped with a 250 W lamp.

WHAT WE CLAIM IS:—

1. An electrophotographic recording material comprising a conjugated oligomeric or polymeric condensation photoconducting product having photosensitivity in both visible and ultraviolet ranges of the spectrum and being chargeable with either a positive or negative charge and containing units having the formulae:



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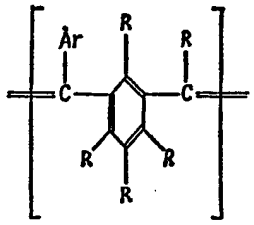

wherein Ar is an aryl group and each R may be any of hydrogen, halogen, alkyl, alkoxy cyano or aryl groups, the product being applied from solution onto glass, metal or plastic foil without addition of an optical sensitizer.

2. An electrophotographic recording material according to claim 1, in which the said product is used in a proportion of 2—99 per cent by weight in combination with a number of non-photoconducting film or layer forming materials without substantial loss of its photoelectric and optical properties.

3. An electrophotographic recording material according to claim 1 and 2, in which the non-photoconducting components are polystyrene or silicone varnishes.

4. An electrophotographic recording material when produced by a method as described in any of the Examples.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1974.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.